SUPPLEMENT.

The Mining Journal,

AILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

o. 1825.—Vol. XL. LONDON, SATURDAY, AUGUST 13, 1870. {STAMPED .. SIXPENCE. UNSTAMPED.FIVEPENCE

NT MEETINGS OF ENGINEERS AND SHIP-BUILDERS AT GLASGOW.

ing the present week joint meetings of the North of England ute of Mining and Mechanical Engineers and the Institution gineers and Shipbuilders in Glasgow are being held in the city. About seventy members of the North of England Insti- accepted the invitations issued by the kindred association in and. The latter institution numbers some 700 members. On ay forenoon the members of the North of England Institution met in the Corporation Galleries, which had kindly been granted e occasion by the magistrates and council of the city by the Provost of Glasgow, and the President and Council of the In- ion of Engineers and Shipbuilders in Scotland.

e LORD PROVOST said that he had been requested to take the for a short time at the opening of their proceedings, just by of commencing the meeting, and he did so with great pleasure, with the opportunity it afforded him of giving them such a ome to Glasgow as he was entitled to do on behalf of the au- ties of the city. He assured them that it afforded the authori- he greatest satisfaction when they were informed of the inten- of so many members of the association in the North of England it Glasgow, and no sooner had they been made aware of that ion than they very gladly allied themselves with the local association to uch preparations for the visit as they thought desirable. He assured it would be very gratifying to the citizens to find that those arrange- had been made for their comfort, and that the various places thrown o their inspection were of a kind to interest them. He had no doubt that he commercial industries around the city and the natural scenery with it was adorned would prove very attractive to gentlemen having tastes at direction. He hoped that the present fine weather would continue g the continuance of the joint meeting, and that the papers to be read d also form matter of interest. He took leave, therefore, to bid the insti- welcome to this city, and if it occurred to them that there was anything er that could be done to interest them, they had but to mention it to the secretary, and it would be attended to with pleasure. (Applause.) In usion, his lordship mentioned that it had been arranged that Mr. E. F. (President of the North of England Institute) should be President of the bodies during the meeting, and he would now take the chair.

r. BOYD, on taking the chair, expressed the thanks due to the Provost, and the authorities in Glasgow, for the trouble they taken in making the preliminary arrangements for the present ing, and for the handsome reception that had been given in this to the North of England Institute. He afterwards proceeded to k of the advantages connected with such institutes, from the op- unities they gave gentlemen for combining their observations, orming comparisons on points which could not be done indivi- y, and by their joint contributions to form a fund to pay the expense of ng the papers read, which contained particulars such as were not to be in encyclopædias, dictionaries, or scientific works. The society he repre- d had now been established for 15 years, and had published 15 volumes. ming to this city they hoped to get some advice respecting the establish- of scientific instruction in schools and colleges connected with such an ution. They believed that the earlier the human mind was turned to sub- f scientific enquiry the more complete and perfect would be the usefulness afterwards. Attention had been much applied of late to this question, e colleges of England had not in respect to it arrived at the position at- by those in Scotland. Having remarked that the Government was in the more than formerly of consulting, in regard to important works, the of individual members of scientific societies, the speaker concluded by ex- ng the hope that the North of England Institute in visiting Glasgow leave some impression behind them, and that many men around Glasgow ad been in the habit of talking and thinking scientifically on subjects, d not written on them, would be incited to produce papers similar to of the institute.

HE CARBONIFEROUS FORMATION OF SCOTLAND.

. JAMES GEIKIE, District Surveyor of the Geological Survey of nd, read the first paper, which was to the following effect :—

land might be divided into three regions :—1. The region of the Northern ands.—2. The Southern Uplands.—3. The Great Central Valley. The Great l Valley, the Northern Highlands, and the Southern Uplands consisted r of the Older Palæozoic or Primary formations, while the Great Central was occupied, for the most part, with the Upper Palæozoic strata. It this region, then, that the carboniferous rocks were chiefly restricted, the basin of the Solway, and in the lower part of the Tweed Valley, car- rous strata also occurred; but as these were connected rather with the rmation of England than with that of Scotland they did not fall within ope of that paper. A little observation would show that in the Central of Scotland the coal-bearing strata arranged themselves into a series of , or synclinal troughs, with separating anticlines, and these anticlinal consisted either of rocks which were older than the carboniferous forma- or of strata which belonged to its low sub-divisions. By comparing the in these seperate basins we found that a complete section of the Scottish niferous rocks gave us four well-marked sub-divisions, which, in descending , were as follows :—1. The Coal Measures.—2. The Millstone Grit.—3. The niferous Limestone.—4. The Calciferous Sandstones. It would give a better f the structure and general phenomena of these sub-divisions if each were d of separately, but the limits of a single paper would not allow of the re of each basin being given in detail. All that could be attempted was t out the more prominent features of the veins, with the view of ascer- g under what conditions the Scottish carboniferous strata accumulated. Mr. Geikie began with the lowest division—the calciferous sandstone series. eries, when typically developed, consisted of two principal groups. It was xposed along the margins of the carboniferous regions, where these abut the older palæozoic formations. In Ayrshire this series showed the two ons very clearly—the upper group consisting of white sandstones, cement- e, clays and shales; the lower comprising a well-marked set of red sand- e, conglomerates, and sandy clays, with occasional irregular bands of a e concretionary limestone or cornstone. There being no Upper Old Red tone in Ayrshire into which the calciferous stones might graduate down- s, these last rested unconformably upon all the older formations. From ature of the fossil organic remains met with in the lower or Red Sandstone p, and from the general character of the strata, it might be inferred that eds were amassed in a somewhat shallow sea, at no great distance from hore. The upper, or "cement-stone" group, was charged in places with fossil remains of creatures whose habitat was either fresh or brackish water. m this fact, and from the very finely divided character of the strata, and irregular manner in which they thickened and thinned out, we were led to clude that the cement-stone group had been slowly accumulated in a series brackish water lagoons, separated by intervening mud-flats. At Greenan tle and the Heads of Ayr certain volcanic rocks made their appearance among cement-stones, and from the mode of their occurrence there could be no doubt t these rocks of igneous origin were ejected at the time the surrounding ta were being deposited in lagoons and estuaries. Passing north-eastward o Lanarkshire, the carboniferous limestone series was seen in the valley of the n, near Stonehouse, resting directly upon Lower Old Red Sandstone, the cal- rous sandstone series, or true base of the carboniferous formation, having ined out and disappeared. It came on again, however, in the valley of the e, above Crossford, but was of inconsiderable thickness, and, what was thy of note, it consisted only of the lower group of red and grey sandstones, upper, or cement-stone group, being entirely wanting. As we traced in wards it once more thickened out, until in the Lothians it reached to the t thickness of from 2500 ft. to 3000 ft. In the Lothians, as in Ayrshire, the s was composed of two groups—a lower group of red and grey sandstones cornstones, and an upper set of sandstones, with dark shales, oil shales, one cipal seam of coal, another of limestone, and other thin bands of the same rock. inuing with the basement beds, we had—first, red sandstones and conglo- ates, which were the old sand banks and shingle heaps that gathered along carboniferous sea coast. At the time of their deposition the Pentland Hills ched seawards as a long promontory from the southern uplands. The grey stones and shales overlying the red basement beds told us that a process of subsidence had ensued, whereby the promontory of the Pentland Hills was carried down below the level of the sea, and eventually buried underneath the gradually accumulating sediment. By-and-bye the igneous forces broke through the floor of the sea, and streams of lava and showers of ashes and bombs were ejected. These now formed the older volcanic rocks of Arthur Seat and Craiglockart Hill, and it had been conjectured that the Castle Rock of Edinburgh marks the vent out of which these volvanic *ejectamenta* were thrown. This volcano became extinct, and vast deposits of sand and mud were slowly plied up on the bed of the sea, giving rise to the great Ganton sandstone group. During the deposition of this group volcanoes again broke out, and lava and ash were ejected over some areas of the sea bottom. After a time the sea would appear to have become partially silted up, and to have been succeeded by a series of lagoons, with intervening mud-flats, corresponding to the similar conditions under which the equivalent strata of the Ayrshire series were deposited. In these lagoons the Burdiehouse, or Queensferry, limestone was slowly accumulated. A process of subsidence now carried down the lagoon country, the sea once more came in, and marine deposits gathered over the site of the limey pools. These deposits were now represented by the Binny sandstone group; while they were gathering considerable ejections of volcanic matter cumbered the bed of the sea in some localities. Once more the sea became silted up, and the low-lying mud flats and banks were overspread with a somewhat tropical vegetation, consisting of certain tree ferns and their congeners; this dense mass of vegetation went to form the Houston coal. During the growth of the Houston coal and Burdiehouse limestone groups the shales now so extensively worked for oil appeared to have accumulated as a fine mud, or silt, in quiet lagoons and estuaries. During the formation of the ironstone coal group volcanoes continued to make their appearance. Indeed, the igneous forces appeared never to have been long quiescent during the calciferous sandstone period, and they increased in intensity as that period drew to a close. In Haddingtonshire the calciferous sandstone series departed a good deal from the typical aspect presented by that group in Midlothian. The basement beds, consisting of red sandstones and conglomerates, graduated downwards into the Upper Old Red Sandstone—no physical break occurring between the Carboniferous and Old Red Sandstone formations, as was the case in the Midlothian, Lanarkshire, and Ayrshire districts. The upper group, consisting of a vast series of volcanic ashes, with some thin limestone bands, overlaid by the great trappean masses of the Garlton Hills, was probably the equivalent of the Burdiehouse limestone group in Midlothian and Linlithgow, and the cement-stone group in Ayrshire. In Fifeshire the calciferous sandstone series rests upon Upper Old Red Sandstone, as is well seen in the Lomond Hills. The series in other parts of the country also give evidence of the existence of submarine volcanoes during that period.

II.—The Scottish carboniferous limestone series was divisible into three groups—1. An upper limestone group, containing beds of limestone and coal, interstratified in sandstone and shale.—2. A middle group with no limestone, but containing a number of coal seams.—3. A lower limestone group, comprising beds of limestone and occasional coal seams. The thickest and best limestones usually occur in this group. The strata belonging to the carboniferous limestone are generally well exposed round the outskirts of our coal basins. No division of the Scottish carboniferous formation, however, exhibited greater variability both as regards the thickness and general character of the strata. The deposition of the series appeared to have taken place during a period of considerable oscillation of level. And the subterranean forces, which induced this oscillation, seemed to have acted with very unequal intensity over the Scottish area. Thus, some districts would have been more frequently in the condition of dry land than other regions; and, while in places the character of the strata told of deep seas, the equivalents of the same beds elsewhere spoke to us of comparatively shallow water, liable to constant disturbance from the muddy sediment washed from adjacent shores. The carboniferous limestone of the Edinburgh basin consisted of a well-marked triple series, and contained no trace of contemporaneous volcanic rocks. When we followed the same strata westwards into Linlithgowshire, however, the series became markedly volcanic. In that region beds of dolerite, melaphyre, and tuff alternated with sandstone, shale, limestone, and coal. But we still had the triple division into upper, middle, and lower groups holding good. Some of the sections of that neighbourhood, showing repeated alternations of igneous with aqueous strata, were then described. In Fifeshire the volcanic rocks, which commenced in the calciferous sandstone period, continued for some little distance up into the limestone series. Then they died out, but after a time re-appeared in sporadic patches among higher members of the same series. Some of the more interesting rocks of this age were then referred to, such as the Hill of Bith, Largo Law, Kellie Law, the Saline Hills, and others. No contemporaneous volcanic rocks were met with among the carboniferous limestone strata of Lanarkshire. Whenever we got the base of that series we found it resting on the calciferous sandstones, or, where these were wanting, on rocks of Old Red Sandstone age. The succession was well-exposed in the Carlake district, and the triple series, so typically developed in the Edinburgh basin, occurred there also. We had an upper group of limestones resting on a middle set of sandstones and shales with coal seams, below which came a lower group of limestones, with several thin coal seams and bands of good clay ironstone. With local variations, the same succession obtained in the other limestone-bearing districts of Lanarkshire; the tendency of common coals, gas coals, blackband ironstones, and clay-band ironstones to thicken and thin away being very marked in this division of the carboniferous strata of Lanarkshire. In the south of Ayrshire the carboniferous limestone series was poorly represented, but thickened out towards the north, and continued to show the triple arrangement. In the north of that county the basement beds of the series consisted almost exclusively of volcanic rocks. These rocks, folded into a broad anticlinal arch, rose up to form the high grounds in the north of Ayrshire and south of Renfrewshire, and thus separated the carboniferous basins of the former county from those of the latter and Lanarkshire. But while they dipped in below the overlying limestones and coal-bearing beds to the north, and rose up again to form the northern boundaries of the carboniferous strata in Stirlingshire, they did not again appear in the south of Ayrshire, but died out below the Kilmarnock coal field. They were interesting to the student of igneous geology, but held out no hope of yielding any minerals of value to the speculator. At the time of their formation submarine volcanoes were very active over that region, vomiting forth sheet after sheet of lava and showers of volcanic dust, scoriæ, and bombs. Not a few of the old centres of volcanic activity could still be made out. Landoun Hill, in the valley of the Irvine, and Dunwan Hill, in the neighbourhood of Eaglesham, were well marked and conspicuous rock-plugged vents of that age. Several good coals occurred in the middle group of the Ayrshire limestone series, corresponding to the "edge coals" by Mid-Lothian. The Dairy blackband ironstone was also a well-known seam upon the same horizon. The upper group of limestone in Ayrshire was overlaid by beds of lava and ash, some of which last was highly impregnated with carbonate of iron. These beds were well exposed in some of the northern feeders of the River Irvine, in the neighbourhood of Kilmarnock. With these outbursts volcanic activity at length died out, and we met with no more contemporaneously formed beds of lava or ash down to the close of the carboniferous period.

III.—After the carboniferous limestone series came to an end, currents began to heap up all over the bed of the sea irregular accumulations of sand. But, just as during former periods so now, considerable movements of the earth's crust continued to take place. The sea would also appear to have been of very irregular depth; for in some places the sand (now sandstone) alternated with fire-clays or old land and alluvial surfaces, while, in what must have been quieter recesses, some few thin limestones and interrupted beds of ironstone were gradually formed. In other districts the deposits consisted of very coarse-grained sandstone or grit, and hardened pebble-beds or conglomerates, pointing to the proximity of land. To this division geologists gave the name of the Millstone Grit. In Scotland it ranged in thickness from some 50 or 60 feet to about 130 fms.; but in some of the little Ayrshire basins it seemed to be entirely wanting.

IV.—The phenomena connected with the highest division of the carboniferous formation—the coal measures—were so similar in all our coal basins, that it was unnecessary to do more than put together a few general notes. The origin of coal was no longer a mystery—everyone knew that it consisted of mineralised vegetable matter. The great majority of our coal seams, undoubtedly, marked the sites of old swamps and forests. In the underclays were detected the rootlets of the plants whose substance had gone to form the overlying coal. Some coal seams, however, had no underclay; and it often happened when such was the case that the coal was apt to vary much in quality and thickness, getting split up with lines and layers of sandstone or shale. The most persistent of our coal beds were those that rested on underclays, which were abundantly charged with *stigmariæ* or roots. Many of the seams without underclays might be due to the submergence and eventual entombment of rafts of vegetable matter, similar to those that were met with along the courses of some of the great rivers in tropical countries. The general aspect presented by the Scottish Lowlands during the formation of her coal fields was that of a broad undulating belt of country, stretching between the Northern Highlands on the one hand and the Southern Uplands on the other. This intervening tract of low-lying ground was covered with dense swamps and forests, through which wound numerous streams. Many of the old stream-courses could still be detected, and were known to the miners as "wants." In these "wants" the coal was seen to be cut through, as it were, and its place occupied by shale, sandstone, or clay, the detritus filling up the bed of the old streams. In quiet lagoons and pools during that period oil-shales, gas coals, and blackband ironstones slowly accumulated. The whole series was formed during a process of subsidence, which ever and anon brought the waters of seas or estuaries to overflow the coal swamps, and deposit above them heaps of sand and mud. When this downward movement of the earth's crust ceased for a time, the sea-bed became gradually silted up, and a new growth of vegetation covered over the hard flats; and this process was repeated until many successive land surfaces were entombed, one above the other. Towards the close of the carboniferous period considerable subterranean movements took place. The result was that the coal-bearing strata were upheaved, and partially dislocated and denuded before the barren red sandstones, which overlie them in Lanarkshire and Ayrshire, were laid down. The unconformity, however, is a very gentle one. These red sandstones were sometimes confounded with the Permian and New Red Sandstone of England, but they unquestionably belonged to the carboniferous series, as was proved not only by their fossils, but by the fact that in Ayrshire they were overlaid unconformably by the Permian.

V.—Some of the most interesting features presented by the Scottish carboniferous rocks were supplied by the igneous masses which are either interstratified with or break through the strata. The igneous rocks already described were all of contemporaneous origin—that is to say, they were erupted at the very time that the sandstones, shales, limestones, and coals with which they are associated were being formed. There still remained a large class of igneous rocks to describe. These rocks were of later formation than the strata amongst which they occur, for they cut the strata in such a way as to assure us that the beds through which they came must have already been converted into rock before these igneous products were erupted. To this class of rock geologists gave the name of intrusive, to distinguish them from the lavas and ashes of contemporaneous origin. He divided the intrusive rocks into three classes—1. Intrusive sheets or "whin-floats," occurring in calliferous sandstones, carboniferous limestone, millstone grit, and coal measures alike. These were referred to the very close of the carboniferous period.—2. Intrusive necks or bosses cutting all the carboniferous deposits. These belonged to the Permian age.—3. Vertical dykes, or "whin-gaws," referable, in all probability, to the Miocene age. Each of these groups was described in detail. The intrusive sheets were composed principally of dolerite, anamesite, basalt, or melaphyre, but sometimes also of diorite, porphyrite, and felstone. As a rule, they conformed to the line of bedding of the aqueous strata among which they were intruded, but they were often very irregular. Their effect upon the coal seams and associated strata was next referred to. The coals showed evident marks of having been subjected to heat. They were often quite consumed to a black dust, or converted into a kind of coke. When the destructive distillation had not been carried so far, a valuable seam often resulted. Such was the origin of our steam coals, blind coals, or anthracites. As these intrusive sheets were dislocated and denuded, along with the strata in which they occur, before the Permian rocks were deposited, they could not belong to a later period than the close of the carboniferous. But of course some of the deeper-seated masses might have been erupted at various times during the deposition of the higher members of the carboniferous formation. The intrusive necks or bosses consisted of plugs of volcanic rocks, filling up old vents of Permian age. They were often found coming up on the line of great dislocations, which shifted the carboniferous strata, but were covered over by Permian rocks without a fracture. The igneous products filling up these old vents also closely resembled lavas and ashes of known Permian age, from which, and from various other evidence, it was concluded that these necks ought to be referred to the times of the Permians. Some of the more interesting examples were then described. The vertical dykes consisted chiefly of dolerite. They traversed the strata in wall-like masses, running in a determinate direction, generally some point north of west and south of east, or at right angles to that. They had not much effect upon the coal seams. Sometimes they coincided with lines of dislocation, in which cases it was to be inferred that they had only taken advantage of these as lines of weakness, along which it was easier to force a way. Most commonly, however, they cut through strata and dislocations together, without producing, or appearing to produce, any vertical displacement of the strata, and as if they had nothing but an accidental connection with the faults which have shifted the coal-bearing strata. From various evidence it had been conjectured that these dykes were of the same age as the volcanic plateaus of the Western Islands and the North of Ireland, and ought, therefore, to be considered as belonging to the Miocene period.

VI.—Mr. Geikie concluded with some descriptions and remarks on the nature of faults. There were at least two distinct systems of faults in the Scottish carboniferous strata. The first system consisted of very large dislocations, with a proximate north-east and south-west trend. To this system belonged the great bounding faults of our coal fields, some of which were then traced, and their effects described. The second system consisted of a double series of faults—one set striking approximately north and south, and the other approximately east and west; these everywhere traversed the coal fields. Perhaps, the east and west faults more frequently attained a larger size than the set which crossed them at right angles. Indeed, many of the north and south faults appeared to be cut off by the others, Some examples were then given. The age of the faults it was somewhat difficult to determine. Some of them were certainly older than the Upper Red Sandstones, but by far the greater number were formed after the deposition of these beds, and before the accumulation of the succeeding, or Permian formation. Others, again, were later than the Permian, and some might possibly belong to the age of the Miocene. Mr. Geikie concluded with a brief summary of the chief points referred to in his paper.

The PRESIDENT said : I am quite sure that you will join with me in thanks to Mr. Geikie for his very interesting and valuable paper. He has got together an amount of information of a most comprehensive character in a very short space. In one part of his subject he referred to the carboniferous series, and the occurrence in it of the basaltic, when sill; and I might ask Mr. Geikie's opinion as to whether that basaltic deposit was an infusion of a protruded molten mass between rocks of the series; or whether it was superimposed or extended in a molten condition over the then surface of the carboniferous series? Mr. Geikie does not particularly state whether he observed the strata overlying the basalt were as much cinderised, or burnt, as those which underlie it. The nature of his answer might explain a difficulty, on which Dr. Sedgwick gave an opinion—namely, that it was a protruded mass, and not laid over the surface of carboniferous series. The other question to which I would draw Mr. Geikie's attention is the extraordinary and rapid rotation of the limestones, shales, sandstones, and coal deposits, because the rotation implies that if the coals were the produce of vegetation once exposed to view—to air and light—the existence of the limestones in close conjunction would pre-suppose that they were the result of a deposit of shells from a deep sea or inland lake.

Mr. GEIKIE replied—There are two kinds of igneous rocks—contemporaneous and intrusive. Both of these igneous rocks occurred in the Scottish coal field along the line of bedding. The contemporaneous rocks altered the beds below them, but never affected the beds above them, because they were erupted either at the surface or along the bottom of the sea, so that they had cooled down before the beds above them had been deposited. The intrusive rocks were masses of melted matter, which had been pushed up by the igneous forces, and forced in between the beds, so that the aqueous strata above and below them were altered by the heat evolved from the melted mass. The beds of coal below the contemporaneous mass might be affected by the heat, but the coal above that contemporaneous mass would not. On the other hand, the coals above and below an intrusive mass might both be affected, but it may very often happen that the coal seams above an intrusive mass were more affected than those below them. There were, however, many exceptions to this rule. With regard to the difference between the English and Scotch limestone series, the chief fact to be borne in mind was this—that in England the thick carboniferous limestone had been deposited in deep sea. As we go northwards into Scotland we find the limestone getting split up, with beds of sandstone and shale, and occasional coal seams, increasing in number as we go into the Scottish coal basins, showing that in Scotland we had shallower water, with oc-

casionally land surfaces, while in England the area continued to be totally submerged.

Dr. BRYCE (President of the Glasgow Philosophical Society) said: Mr. Geikie has given us an admirable outline of a wide and difficult subject. I think we ought to thank him for the admirable manner in which he has handled his exposition, not dwelling too long on any particular branch of his subject. I know the most of the country to which he has referred very well, and I can say that he has given us a very faithful account of its leading phenomena. I would beg to call the attention of English geologists to the fact that we are differently circumstanced from what they are. The carboniferous limestone of England is different from the carboniferous limestone of this district. Our limestone does not form a great mass at the base of the hill series, as it does in England. Those who know Lancashire and Yorkshire will remember what vast masses of limestone are below the millstone grit with which you come into contact in the coal series. In Scotland the millstone grit scarcely exists at all. Those gentlemen who are going to make an examination of the neighbourhood will have an opportunity of inspecting some of the sections which are exceedingly well exposed in the hills near Glasgow, north and south; but they should bear in mind that the limestone is not in a proper normal condition. Over the millstone grit came beds of limestone with coal, and in the immediate neighbourhood of Glasgow many fresh-water and estuary shells—not truly marine shells—are found in the upper beds. This is especially the case in connection with the blackband ironstone, which has been such a mine of wealth to us in the West of Scotland, but which is now, in a great measure, exhausted. Then we come to the question—what are we to do? Shall we be able to go deeper down, and work coal from depths to which we have not hitherto reached? We don't know to what depth the coal may go. We have the Old Red Sandstone ranging across the hills, which are visible the whole way from the city. I am much tempted to go into some of the topics to which Mr. Geikie has referred, especially that of the whim dykes. One of these crosses the centre of the city, at the Necropolis, and can be traced down to Ayrshire and Renfrewshire for many miles. On the north-west side of the city you come to one of these enormous underflows, with coal above and below.

After a few words from Mr. JAMES RUSSELL, as to the discovery of reptilian remains at Airdrie, a vote of thanks was awarded to Mr. Geikie for his paper.

[*To be continued in next week's Mining Journal.*]

SOUTH MIDLAND INSTITUTE OF MINING, CIVIL, AND MECHANICAL ENGINEERS.

The monthly meeting of this institute was held in the Corn Exchange, Wolverhampton, on Monday. Mr. J. P. BAKER, the Government Inspector of Mines for South Staffordshire (the President of the institute), was in the chair, and there were likewise present Mr. H. Beckett (ex-president), Mr. E. Jones (of the Lilleshall Company), Mr. T. Rose, Mr. Silas Bowkley, Mr. Walter Ness, Mr. T. Walker, Mr. James Cope (hon. sec.), and many others.

The following gentlemen were elected new members:—Messrs. Abraham Baker, Bloxwich; Arthur Hinde, Bilston; John Hannan, Gas-works, Wolverhampton; and William Deeley, Bloxwich. The institute now numbers 133 members.

The Hon. Secretary read a communication from Mr. Daniel Jones, of Kilsall Hall, Shiffnal, offering a paper on the "Springs of Codsall Wood and Wellington." A discussion arose on the question of whether or not the paper could be read by a non-member. On an appeal to the meeting by the President, Mr. Jones's paper was adopted unanimously, it being understood that the paper should become the property of the institute. The paper, it was understood, would have a bearing upon the proposed sinkings for coal on the Shropshire side. The PRESIDENT then delivered the inaugural address, which he promised at the time of his recent election.

Mr. J. P. BAKER (the President) said, that that institution was not ushered into existence hurriedly, nor without many months of careful and serious consideration, both as regarded the probability of its ever getting a footing in that district, and also of its relationship to institutions of a similar character. It was first named to him by one individual, to whom he promised his humble support, whose name, however, it would perhaps be invidious than to mention. The subject remained in abeyance for about two years, when, at length a meeting was convened by circular on March 17, 1869. The meeting was numerously attended, and steps were agreed upon for the establishment of an Institute of Mining, Civil, and Mechanical Engineers. That resolve, he was proud to state, had been carried to a most successful issue. The object of the institution was to concentrate all the professional, mining, and other experience within its reach, with a view to devise means which might avert, or at any rate alleviate, those sad calamities that so frequently caused destruction to life and property in working the mines of that and other parts of the United Kingdom. Therefore, a large field was open, not only for mining, but also for civil and mechanical engineers—all of whom were comprised and embodied in that institution, the scope of which should know no local bounds; and, he would add, limited only to the civilised world itself. If the institution should be properly conducted—and he had no reason to expect anything to the contrary—it could not fail to be intimately connected with the interests of the coal proprietors and the lessees of the mines of that immediate district, which, as time went on, would be more apparent; for the trade, whatever might be the opinions of other people to the contrary, must, sooner or later, derive great advantages therefrom.

Being associated together for the improvement of the art of mining, not only practically, but scientifically, with a view to the best mode of working the coal mines, both as regards safety and economy, the proprietors and workers of our coal fields would, he hoped, feel themselves interested in the success of the institution. Their support was, therefore, humbly solicited. The members of the institute would have to grapple with various branches of science. He thought that he could not do better than first of all call their attention to the prevention of accidents in mines. Whatever might from time to time engross the attention of the institute, he earnestly entreated that the preservation of the lives and health of their hardy and adventurous colliers might stand foremost, as a subject of paramount importance, as a subject for the serious consideration of every member. As a means to this end, the ventilation of their mines should be seriously considered and thoroughly understood, with a view to secure an abundant supply of pure air, both certain and regular. Therefore, the different modes of artificial ventilation—rarefaction by furnaces, ventilation by fans, steam-jet, &c., all of which were ventilating powers of the greatest value, should be thoroughly enquired into, and their respective merits discussed, together with their general application, whether as to deep or shallow mines. The consideration of this important subject might probably have some bearing on the duration of their coal fields. The atmosphere of deep mines would become an important subject of enquiry in the development of coal fields at present unknown, some of which, however, might exist much nearer their own basin than most of them probably imagined.

He would take the opportunity of stating that, considering the rapid exhaustion of their known seams, the question of exploring the district did not admit of much delay. The quantity of coal raised in that district last year reached nearly 10,500,000 tons, short weight. Therefore, he considered it the duty of that institution to watch the signs of the times, and carefully investigate the subject, with a view to ascertain the best site for a trial shaft, which, after being determined upon, should be brought before the public. But as regards the getting up of limited liabity companies for such a purpose he might, perhaps, be allowed to say that such a proceeding was hardly comprehended within the scope of its labours. Not much progress had been made with a view to improvements in the various modes of working their coal for many years. Indeed, very little had been done in that respect since the days of the late Mr. George Jones. That gentleman, 35 years ago, made the first attempt to work the Thick coal at twice—by working the upper strata, or top part of the seam, at the Shutt End Colliery, near Kingswinford; and where, he was delighted to say, they had enjoyed almost, if not quite, complete immunity from fatal accidents by falls of coal and roaf. This successful change in the mode of working had been the means of preserving the lives and limbs of many a collier, and also of preventing an untold amount of distress and poverty in the homes of the mining population in that immediate neighbourhood. Hence the name of Mr. Jones ought to have a prominent place among them as one of the greatest benefactors of the people with whom it was for many long years his privilege to live and labour. The name of many a man of less pretensions and achievements had been immortalised. The deaths by falls in 1869, in the 12 inspection districts, reach 466. Of these no fewer than 68, or about 14 per cent., happened in South Staffordshire. Such a state of things loudly called for and claimed their serious consideration as to whether or not that sad waste of their colliers' lives could not by some means be greatly diminished. Less width of Thick coal openings, a more abundant and liberal use of timber, and a more careful regard as to its application, both in thick and thin mines, would greatly tend to bring about this desideratum; and last, but not least, better discipline maintained underground, together with the exercise of kindly feeling between men and masters, and a hearty co-operation in the interests of each other, would also go very far to prevent accidents of this and every other class. These things should be made the chief study and concern of those of the members who came into daily business contact with the collier. Again, with regard to accidents in shafts, that district stood highest in the list for 1869. He trusted their mechanical friends would invent and adopt something new to prevent over-winding. There were several inventions of great value already in existence. Nevertheless, he would like to see some scheme for arresting the winding-engine in case the engineman should leave the hand or valve gear before the cage reached the top of the shaft. Ropes and chains required great judgment in their selection and application, especially "wire bands," otherwise loss of life and destruction of property would, he feared, still occur. The fitting up of their shafts with guides was a subject of the greatest importance, both as regards safety to life and limb and economy. The walling of the shaft was continually subjected to damage, and sometimes to total destruction, by winding in open shafts. Falling into shafts from the surface was another source of loss of life in that district, and one which might be so easily prevented, either by lifting wickets or the permanent travelling fence.

After recommending the use by the collier of the safety-chain when cages were not used, the President discussed the employment of gunpowder in mines. The time, he thought, had now arrived when the firing of powder in mines, either evolving or containing pockets or reservoirs of gas, should be investigated in the most careful and impartial manner. He inclined to the opinion that its use in all fiery mines should be prohibited; and also in mines where gas might be suspected to exist latently in the solid coal or roof, or otherwise in the "goaf" or excavated parts. Shot-firing in that district had, no doubt, been the cause of fatal explosion, owing to the flame from the powder igniting gas in the coal overhead, and where gas was allowed to exist in the "goaf" or waste near the shot. In one or two such instances the practice had, upon his recommendation, been discontinued. To free a use of gunpowder had, no doubt, been tolerated in most, if not all mines, especially during the last 20 or 30 years. We seldom find now-a-days workmen hammering at large iron wedges. The cry is—"Give us powder!" And what for? Why, in many instances, to smash the coal and save labour. It would be well for the members to consider the recent inventions of Messrs. Bidder and others. Not one of these gentlemen had, so far as he could remember, thought fit to write him a line on the subject of their inventions, or he should be glad to do everything in his power to facilitate, where necessary, their introduction for trial in the mines of that district. Suitable hydraulic machines were, however, in use at some of the collieries in the country.

Suffocation by gas was another great evil. Upon that subject he could not do better than refer them to the Act of Parliament. To prevent irruptions of water the requirements of the Inspection Act should be most diligently observed. Machinery both below and above the ground required great improvement. Go where they might there was nothing in Great Britain which he had seen or heard of so rude in construction as the winding gear which might be found at some of the collieries in that and the Shropshire district. Nevertheless, it was due to both those inspection divisions to state that, notwithstanding their rude and rough character, the fatalities by machinery compared favourably with any other district, and he was strongly impressed that they were more free from fatal accidents of that class than any of the other districts. This was especially so if they took into account the comparative number of their winding-engines. To this subject, on the score of economy, as well as of safety, he would strongly and most earnestly invite the attention of the members of the institute. As to civil engineers, if they were more frequently consulted in the winning of collieries fewer mistakes would be made. The office and position of a civil engineer ranked high in the character of an institution of that kind. He was not unmindful of other branches of scientific research, nor did he expect the "Transactions" of the institute to be limited to mining alone. He said: Open wide the door of the institute for the culture of philosophical and other sciences, so that the minds of its members might be well stored with all useful information which might have any bearing on their occupation, thus fitting them for higher posts of usefulness in their respective spheres of labour. Speaking of the lighting of mines, the President said that candles and lamps should never be used together in the same section or side of work. *The term "safety" lamp was a misnomer. No lamp yet invented was perfectly safe.* Great care was, therefore, necessary in the selection of mining lamps. After sketching the proceedings of the institute in the past year, the President repeated his exhortation of a twelvemonth ago, at the formation of the institute. He would say, "Let your motto be 'Onward.'" Influenced with this motive, and every member working with the officers, the institute would soon become one of the most useful and important in the kingdom. (Applause.)

The President was thanked for his address, on the motion of Mr. H. BECKETT, seconded by Mr. E. JONES. In responding, Mr. BAKER gave renewed expressions of warmest interest in the institute, and promised to continue to aid it in every way in his power.

After Mr. T. ROSE had called attention to Grafton Jones's hydraulic wedge for breaking down coal, and to King's apparatus for preventing accidents by overwinding, the meeting was at an end.

Original Correspondence.

NOTES ON CONTINENTAL MINING—No. VII.

THE HARTZ MOUNTAINS.

In taking our rapid survey of the Prussian mines, we left Frankfort-on-Maine, *en route* for the Hartz Mountains. After spending the night at Cassel, the next morning we fell in with a company of students, whom we accompanied to the famous mining schools of the University of Gottingen. Of all classes of humanity, your German student seems to be the jolliest specimen. A casual *rencontre* at a croquet party, or being thrown together as *confreres de voyage* for an hour or two, are quite sufficient to make him the most amiable and communicative of boon companions. The celebrated University of Gottingen was founded by our own George II., and contains at the present time over 800 students. A wholesome enthusiasm for study prevails amongst them. This was strongly manifested in the contemptuous manner in which one of these gentlemen, who had spent a couple of years in one of the Northern United States, spoke of the superficiality of knowledge among the Yankees, and their unscientific and money-clutching spirit. With respect to the mining students in the University, as part of the year's course, each individual is required to devote two months to practical working in the various operations connected with the mines. We found, however, that in many cases this was little more than a figure of speech, and that most of the students contented themselves with watching the miners at work in the various levels, and soothing their contemplations with sundry Havannahs.

The Hartzgebirge occupy a district some 55 miles by 25 miles, and consist of a succession of hills, from 2000 to 3000 feet high, mostly wooded to the summit, and scattered in the most irregular profusion, leaving only narrow ravines between them. On the north and south the hills rise abruptly from the Germanic plain, while on the west the ascent is pretty gradual, and on the east the hills melt into the elevated table-land, called the Eichsfeld, which connects this group with the Thüringerwald.

Leaving the rail at Caltenberg, the nearest point, we proceeded to Osterode by diligence, and thence *a pied* to Clausthal, the centre of this mining district. Here we presented our credentials to Herr von Groddeck, the Director-General of the Hartz Mines, who received us with all courtesy, and gave every facility for investigating the mineral resources of the district, by introductions to the mines and works, and by directing our attention to the various plans and sections of the district, and to the models of strata, of workings, and of machinery, with which the Clausthal School of Mines is liberally supplied.

The nucleus of the Hartz group is granite, on the flanks of which lie greywacke, Silurian, and Devonian beds. The degree of igneous induration differs widely in different parts of the hills, from the friable marl of the Devonian to veritable slate rocks. In many instances each separate hill seems to have formed a distinct centre of upheaval; whilst in other cases, and notably in some of the peaks flanking the Vale of the Oker, evidences of disruptive force, subsequent to the formation of the hills, were quite apparent.

The most striking feature of the Clausthall district is the arrangement for water drainage. This does not apply simply to the mine water, or what the Belgian miners call *sang de vein*, but since all the motive-power in the various mines is derived from water, and as, in order to secure the requisite fall, it is frequently necessary to have the water-wheels some distance down the shaft, it is evident that the surface water thus introduced, together with the water proper to the mine, make an effective system of drainage imperative. Various attempts have been made to drain this district since the period when these mines were first commenced, 1000 years ago; and in modern times it has been sought to be accomplished by the construction of a deep adit, into which each separate mine might drive a level. As the explorations deepened it was found needful to drive lower levels; each successive work requiring to be longer and more expensive. The level at present effecting the drainage called, in honour of the prince who inaugurated it, the Augusta level, is a splendid piece of engineering. It was commenced at 30 different points, and when we say that these numerous sections when driven were found to fit each other accurately, we need offer no higher tribute to the care and excellence of the engineering skill. The adit, which passes at a depth of about 300 yards beneath the wooden church of Clausthall, occupied 23 years in construction, and cost 66,000*l*. The length to the outlet at Grund is six miles, but with the branches and junctions with the various mines, not included in the above estimate of cost, reaching a total length of about 11 miles. The largest work of the kind in England is the great adit of Gwennap, Cornwall, which, with its various ramifications, reaches the length of 30 miles. In certain parts the Augusta level is used by way of canal for the transportation of ore. Water being the sole motive-power, every care is taken to collect and store up the little streams from the higher lands. In the immediate vicinity of Clausthall there are 63 ponds, which supply the water-wheels in the works and mines. Forty-six of these wheels are fixed on the surface in the usual manner, but no less than 21 are erected in the shafts, and some even at the bottom. Armed with an introduction from Herr Von Groddeck, we visited in detail the Caroline and Dorothea Mines. In descending the mine the most striking feature is the immense size of the shaft for a short distance down—say, 40 yards—being no less that 24 yards in diameter; and the unwonted spectacle in an English mine, of machinery, winding gear, and one or two water-wheels, all in the body of the shaft, and several yards below the suface. Below the level of this machinery the shaft assumes ordinary proportions, with, however, the precaution of having the winding shaft separated from that for the ingress and egress of the men. In the Dorothea Mine the machinery is worked by four water-wheels, the largest of which, fixed in the shaft 20 yards below the surface, is 48 ft. in diameter. They are arranged at different levels to re-use the same water. A special apparatus is fixed to the delivery trough to enable the water in starting the wheel to flow at once into buckets over about one-third of the wheel. Each wheel is capable of the reverse motion by a very simple adjustment. A peculiar arrangement, after the fashion of an indicator, is in operation at this mine, by which every movement of the hoisting or winding machinery is reacted on a small scale in the office, so that the manager can see at any instant, in model, every mechanical movement connected with the pit. Ladders are fixed in successive flights of 20 rounds each, down the shaft; but the workmen go up and down by means of the man-engine. As this apparatus is comparatively unknown in England, there being, we believe, but one, that at the Devon Consols, we will describe it more fully. This *machine a monter*, as the French miners call it, consists of two stout wooden rods, about 6 in. by 10, reaching in lengths of 40 yards down the pit. These are fixed at the top to a common pumping-crank, turned by the water-wheel, giving a 6-ft. stroke. As the rods work by contrary motion, it is clear that if little platforms be attached to them at distances of 12 ft. the miner, by transferring himself from one to the other of these rods can descend or mount with the greatest ease.

The rods are fixed 18 in. apart, and the stepping platforms are barely 6 in. by 8 in., affording, as we think, a capital strengthening exercise to the nervous system. Some man-engines we noticed in Belgium, and particularly one of Sir John Cockerill's, at Seraing, were furnished with large foot-boards that fitted close together when the stroke was complete. As the alternate stroke is caused by the revolutions of the water-wheel, there is an instant, that of passing the centre, when both the platforms are momentarily stationary, which is, of course, with the workmen the moment of transfer to the other foot-board. Before trusting ourselves to the tender mercies of this peculiar method of locomotion we were treated to a piece of advice, which we found of the greatest service—to grasp securely the projecting piece of iron, intended to serve as a handle, before stepping on to the next foot-board. Having descended by ladders to the workings, we traversed several of the levels. The vein consisted of quartz, carbonate of lime, argentiferous galena, copper pyrites, &c., enclosed between walls of greywacke about 10 ft. apart. The vein seemed very liable to bunches, which made the workings appear less regular and methodical than is the case with most of our English lead veins in Cornwall and Cumberland; and presented in some parts the appearance of a series of connected caverns, in which the ore was being got away in some places for a breadth of 30 or 40 ft. There was considerable difficulty in obtaining information respecting the value of the vein-stuff as a whole, but from a comparison of several statements the average of several mines was from 2½ to 3 per cent. galena for the entire vein. The ore when dressed gave 75 per cent. lead, and on the average 100 ozs. to the ton for silver. The present depth of this mine is over 2000 ft. It is raising at present 1200 tons of silver-lead ore per month. The levels and cross-cuts are numerous and intricate, the result of mining operations for the last 300 years; and in their recesses employment is found for 2000 workpeople. No boys work in the mines, but some are employed on the surface works, above the age of 11 years. In one of these levels a mass of timber was pointed out, which, from the records of the mine, it seemed had been placed in the gallery for support, upwards of 200 years ago, but which is now in great part converted into brown coal or lignite. The fracture is decidedly mineral, and when ignited its behaviour is similar to that of other Bovey coal, of which there are such extensive deposits in North Germany. Little or no timber is used in the mine, except in the form of scaffolding, in the parts where ore is at present being quarried. In coming up from the mine we ascended by means of the man-engine, which, though apparently dangerous, does not seem to expose the miners to much risk when they are accustomed to the movement, and it certainly saves a vast amount of fatigue to the workmen, as well as other and more serious evils, such as asthma, palpitation, &c., to which the daily journey up and down 2000 ft. or 3000 ft. of ladders exposes the miner.

Most of the mines in the Hartz Mountains are worked by Government. The monetary wisdom of the step is open to grave objection, and it has frequently been urged that it would be more advantageous to the State to lease the mines on royalty to private companies. From a consideration of the Hanoverian Budget, it appears to us that, after deducting the official salaries and other expenses from the profits of the mines, the net proceeds are very small; for though there are many veins of immense value, there are others where the produce does not pay the cost of working. The Government suppose that if these mines are thrown open to private enterprise the richest only would be worked, while from the inferior many thousands of workpeople would be shut out, and a portion of the Hartz population deprived of the means of existence; in fact, the State employs and feeds the inhabitants in true paternal style. The men are paid on

Saturday night in the very silver they have dug out, and washed and smelted, and coined during the week. The State also keeps stores of corn and other necessaries to which the thalers eventually find their way. Everything about the people, their wages, the parishes, and courts, savours of direct State interference, and indicates a condition of dependance on the part of the people not particularly healthy in a social point of view. But of this more when we come to review the condition of the German miners and metal workers.

"NOTES ON CONTINENTAL MINING."

SIR,—I perceive that you are publishing a series of papers on "Continental Mining," and the tone of the articles would lead one to infer that the writer thereof had personally visited the very interesting coal fields of the Continent, and well stocked his note-book with observations, and had returned, opening bare his "book of travels" for the especial benefit of your numerous readers. A very proper and good thing too. Having myself a few weeks since returned from a visit to parts of the Belgian coal field, I have read with curiosity and interest the articles referred to. Before leaving England on this tour of scientific inspection, I took the pains to look up all possible information as to the geological and mining particulars of the continental coal fields. Amongst the works I perused I may mention the many valuable and interesting details I gleaned from Simonis's "Mines and Mining," Dr. Ure's "Dictionary of Arts, Science, and Mines," Professor Smyth's invaluable little work on "Coal Mining," Government documents, &c. With a refreshed memory, assisted by copious extracts in manuscript of the details given by the various authors above mentioned, and the possession of a note-book full of information, elicited during my tour, I eagerly perused the articles appearing in the *Mining Journal*, in order to compare notes. In so doing I soon detected a want of originality, and on completing a sentence here and one there, I was reminded by memory that I had seen the very same details in works above referred to; yet the articles appear *prima facie* to be written from notes taken personally on the spot. I did turn to my bookshelf, and opened a volume, when, without surprise, I found that a great portion of the information contained, in especially the two last articles, appearing under or in the column of "Original Correspondence," was before me in print. I can put my hand on a foreign work (in the French language), which cost little over a franc, in which is contained the sum and substance of the article on the "Sanitary Condition of the Belgian Miners." I do not for a moment under-rate the interest and value of the details given, but I do dislike such cookery and such patent "literary deception," especially when carried on by those who go out of their sphere to do it.

In justice to the authors of the various works from which your correspondent has gleaned so much, and in justice to the readers of the Journal, he should acknowledge his obligations to such, when the articles will be valued as they deserve. T. PARTON, F.G.S.

Willenhall, Aug. 8.

COLLIERY EXPLOSIONS, AND SAFETY-LAMPS.

SIR,—The proposition that you make in last week's Journal is the only one calculated to meet the urgent necessities of the case. The explosion, upon which the comments are made, and which occurred near Swansea, was, from what can be gathered by the published accounts of it, of the most awful character, and yet the mine was well ventilated. There can be no doubt that the latter assertion is quite true, as a mine giving off explosive gas in considerable quantities, and well ventilated, if worked with naked lights is really very likely to be the scene of one of those awful explosions either sooner or later. All that is required is a fall of stone in one of the returns of more than ordinary magnitude, either a district branch return, or a main return, or it may be the disarrangement of a brattice, may produce the conditions necessary for a serious explosion, and this may yet be almost beyond the control of human agency.

I would certainly not hesitate to assert most fearlessly that all mines of a fiery character should be worked exclusively with locked safety-lamps; but if *all coal mines* are not to be worked in this manner, where and by whom is the line to be drawn? It must be conceded that there are well-known tracts of coal pretty well defined in most coal fields, and over those tracts very little, if any, explosive gas is ever detected—that is, as a general rule; but this rule is liable to be violated, as many remarkable and serious cases testify. But if the proposition laid down were only carried out so far as to include all mines of a fiery character, there can be little doubt that a great reduction in the number of explosions would take place, while its application to all mines without distinction would most certainly reduce this class of accidents to a minimum.

It is, perhaps, hardly to be expected that these accidents can entirely be prevented in the present state of mining science, but it would be exceedingly wrong "to rest and be thankful" in the present state of this question. Of course, when I say that the safety-lamp should be used in all mines of a fiery character I would draw the line, if possible, considerably on the safe side; and when it is recollected that in very harmless mines the pillar working is conducted with safety-lamps, only a small portion of mines, worked at a trifling distance from the surface, would or ought to be worked with open lights. If a broad distinction like this were drawn there is little doubt that explosions would be very considerably reduced, and in course of time, as improved ventilation is effected by mechanical means, would become entirely unknown.—*Newcastle, Aug.* 8. M. E.

GOVERNMENT INSPECTION OF COAL MINES.

SIR,—The increase of the loss of life in proportion to coal raised in the coal mines of England, Wales, and Scotland during the last five years must be somewhat discouraging to the efforts made by Government for its prevention. The deaths from explosion arise principally in the ill-starred districts of West Lancashire and South Wales. The failure of inspection to lessen the number of these calamities points to other and more stringent measures being required for their prevention. There is no doubt Government must take the initiative in any radical changes to be made with this object in view; and as they from time to time are favoured with the views of practical men with regard to prevention of colliery accidents, they will be enabled, we trust, with the assistance of their official advisers, to weigh the advice and suggestions so tendered, so as to eliminate from these some practical rules applicable to the condition and safety of all mines.

It would not be difficult to say what the effect will be of prohibiting the use of powder in coal mines. If this had been done three years ago many deplorable accidents would have been avoided, and substitutes for powder, now only partially used, would soon have become generally adopted. It may be mentioned with respect to Chubb's hydraulic coal-breaker, that two of them are in use at Powell's Lower Duffryn Colliery, one at Middle Duffryn, and one at New Tredegar, to the entire exclusion of powder in those mines. Neither this nor the wedge hydraulic machines of Messrs. Bidder and Jones have been yet adopted in the Lancashire mines, where a substitute for powder is really most required. A similar wedge machine, driven simply by a large hand-hammer, is worthy of consideration. There are cases, as at Hindley Green, where the force of circumstances has brought into use ordinary wedging instead of blasting by gunpowder, without inconvenience. Of the appliances now before the public, as equivalents for the prohibition of blasting with powder, there are sufficient to meet the cases of various conditions of coal seams, if necessity pointed the way. The question of lighting all coal mines with safety-lamps is not unreasonable, and quite practicable, when it is considered that Clanny lamps furnish sufficient light, that they are as safe or more so than the Davy lamp, and that lamps generally differ little in cost from candles. The Stephenson lamp or others would be brought into use in exceptional cases, where fire-damp abounds, or comes off in large quantities as outbursts.

There is a third point, which bears strongly on the question of accidents—the employment of fresh and undisciplined men in coal mines. A strict watch must be kept on inexperienced hands until they are versed in the practice of mining, and may be held responsible for their actions; care being taken to retain only trustworthy men.

I will only briefly advert to other measures, which have before been offered as suggestions for the prevention of accidents—that the rules of every colliery should be printed, in plain and concise language, and a copy of them given to each man, who must be required to read them, or understand their purport. An attentive and careful supervision of the working places by the firemen and overman of every mine before and during working hours, and the supervision over these of the viewer or manager. The special rules for coal mines are now made so as to meet every case, and a difficulty with respect to them is in having men properly informed as to their meaning, and what is required of them; a good overman will, however, keep a watch on the rules being strictly attended to, on the safety of the working places, and on the ventilation; the viewer will carefully overlook and see to the safety of the whole; and occasional visits from the Inspector of Mines would tend to keep everything in proper order.

It has already been pointed out that 23 per cent. of the deaths in the year 1869 were occasioned by explosions of fire-damp, and 42 per cent. were occasioned by falls of roof and coal; in the latter class it seems that a better system of timbering and securing working places might be agreed upon and adopted in our mines, so as to obviate this great evil.—*August* 9. C. V.

THE WAR, AND BRITISH MINING INTERESTS.

SIR,—With unfeigned pleasure have I read, in the *Mining Journal* of the 6th inst., your notice respecting the bearing of the war now raging on the mining industries of this country, the opinions therein expressed entirely coinciding with my own. Assuredly if we who are at peace suffer in our business, they who are actually engaged in the deplorable struggle must fearfully participate in the ruin consequent on all wars, be they conducted on ever so modern, or so mis-called Christian, principles. As long as Great Britain remains mistress of the sea her home mining must be continued as a *bona fide* national investment; not that foreign rivalry and competition will be extinguished, but that the raising the ore, and cost of transit in bringing it to market, irrespective of all other adverse conditions consequent on war, will infallibly render the expense so great as to more than counterbalance the naturally unfavourable position of the home producer with regard to the low yield of his ores. More especially does this argument tell at present against German mines. Even should the war be ever so brief, and even to terminate in favour of the Prussian people, a long period must elapse before the most elastic and personally necessary trades and commerce can be restored to their wonted equilibrium. What, then, can be expected for mining in these countries? Even in Germany mining is as speculative as in England. Further, a large proportion of the capital engaged therein is British. If we complain of our home condition, how then?

It is well known that the bulk of the zinc consumed in this country is imported from German dealers in a manufactured state, and that here it is merely made up into such forms and appliances as our export and home consumption demand. This zinc is chiefly smelted from calamine (carbonate of zinc). Some years since the majority of British zinc ores were unsaleable; now, however, considerable quantities are being smelted, in combination with continental produce, at Swansea and other places; then sold as spelter, for which a large demand exists in the manufacture of brass, yellow metal, bronzes, &c. I am not aware that any zinc rolling mills have have yet been established here. I am informed by parties largely engaged in zinc operations, therefore well able to give a sound opinion on the subject, that the better qualities produced by our smelters can be so manipulated and refined as to be quite capable of being adapted to every known purpose. Now the war will, beyond doubt, interfere with the German zinc business, as well as others: this will create a demand elsewhere; whence the supply may be easily conjectured. Capital in abundance there is in this country for such an undertaking. Some years since I was invited to join a zinc rolling mill in Wales. Zinc blende (sulphide of zinc)—"Black Jack"—mines will become valuable, and will be wrought, when home requirements shall have steadily set in. This ore in the British isles is generally found associated with copper and lead ores, particularly the latter. In young mines the yield of zinc ores forms not only an important item as revenue, but is held in high estimation by miners, as being indicative of more valuable mineral below. Within the last few years the price of it has greatly advanced, and is now nearly equal to that of the average of Cornish copper ores. A little advance would set many mines to a great advantage.

Continental difficulties will so much increase the rate of freights that poor ores, and those highly charged with sulphur, cannot be imported at present prices. The rich Cape and Chilian produce will continue to be brought in, but as the poorer ores of the West of England and Ireland are largely employed in the process of smelting these ores, I judge the standard for them will advance very considerably.

I think I need hardly advert to our coal and iron industries; they will, under any circumstances, be well employed, since they form the staple of war material; and, as you observe, the definition of what is contraband should be definitively and quickly specified.

In the leading article of the Journal, to which I previously alluded, you have given valid reasons for supposing tin will increase in value, as well as for its present depressed condition. I commend these remarks to the serious consideration of all persons embarked in that branch of business.

With reference to home adventures, I cannot but suppose the difficulty of continuing calling and non-dividend concerns will be very great, and the introduction of new undertakings still more arduous; but even these conditions will have the advantage of winnowing the mining market, and lead to the exclusion of many so-called mining speculations, that have done incalculable injury to legitimate mining; it will also, in a great measure, curtail the rage for foreign schemes, of late so prevalent, seeing that the mere caprice of a Sovereign or a Government may at any time upset and ruin the apparently best and soundest undertakings.

These undeniable facts and premises should tend to satisfy the British mine adventurer, if his stock be well selected. At the present juncture the undue depression caused by circumstances over which no control could be exercised affords opportunity for investment that have not for very many years occurred, and I trust will not be for many years again witnessed.

I conclude by again expressing my opinion, founded on the forementioned data, that the British miner and adventurer have all to hope for, and little to dread, from the present aspect of foreign affairs. AN OLD AND CONFIDENT ADVENTURER.

London, Aug. 8.

NEW ZEALAND, OR THE BRITAIN OF THE SOUTH.

SIR,—There are few people constantly residing in happy England who have any idea of the vast extent and value of the British colonies, nor of the spacious area of these vast possessions; and there is probably more ignorance as to the character and vastness of the colony of New Zealand than any other of those expanding fields of future prosperity with which a kind Providence has blessed our country, as an outlet for her industrious population, and for the future wealth and happiness of her hardy sons and daughters.

It will surprise some of these quiet stay-at-home people to be told that these apparently little islands, as shown on a map of the world, and which appear to have been pushed out from the society of all other lands in the southern hemisphere, contain an area of nearly 80,000,000 acres, or 112,000 square miles, and possessing a greater coast-line than England, Scotland, and Wales, which is broken into very many good bays, into which are discharged some very important rivers, which, as the country becomes settled by us Anglo-Saxons, will be made available for internal navigation, by removing the bars which always occur in rivers similarly circumstanced, but which defects can be in a great measure removed so soon as the necessity arises for such undertakings being effected.

The steady progress of advancement that has been going on since the ship Tory sailed from England with the first settlers for this Britain of the South, in 1839, is very remarkable—the more so as at no period has this important colony received the same fostering care from the Home Government that other British possessions have had accorded to them; and yet we find at this moment nearly 250,000 of our hardy fellow-countrymen who have made a home in these antipodean islands, which have risen into importance purely from their own resources and the indomitable perseverance of our countrymen.

From the recent returns received from the colony we gather the following facts, from which some idea may be formed of her vast mineral resources, which were not known to exist till 1857, and then, as is always the case, was not believed in for some three or four years after that date, and these products have been obtained from only an infinitesimally small portion of the country, the majority of the interior of which remains to this hour quite unexplored, all the settlements being only yet dotted about, far distant from each other, on the extensive coasts. But we find that this child of ours, who was turned out in the world by an ungenerous mother, without her fostering aid, has sent to its parent the liberal contribution of 20,024,218*l.* in 13 years, to help her manufactures and increase her wealth, and this vast amount has been obtained only from six small districts. But besides the above amount she has retained enough for her own currency, and also to pay for her imports from China, Australia, the Mauritius, &c.—so that the actual amount of gold produced must have been between 28,000,000*l.* and 30,000,000*l.* in value.

The following is the return given of the various shipments from the respective places, ranging from April, 1857, to March 31, 1870:—

Otago	Ozs. 2,568,447	Value £10,006,522
Westland (County)	1,355,218	5,327,247
Nelson	925,442	3,624,092
Auckland	243,497	792,089
Marlborough	34,878	134,314
Southland	27,813	109,954
Total	Ozs. 5,155,295	Value £20,024,218

The *New Zealand Examiner* gives the following statement:—

The quarterly return of revenue to March 31 last showed that the total imports amounted to 1,378,127*l.*, and the exports to 1,989,219*l.* The gold exported was valued at 616,608*l.*; the wool at 1,134,824*l.* The grain shipped to other colonies was valued at 20,381*l.*; the flax, 39,134*l.* The ships entered inwards were 201; outward, 199. The population of white faces, or "Pakehas," amounted to 237,249, far outweighing by four to one the natives—so that war may be said to die by effluxion of time. The wonderful progress of the "Britain of the South" has been such as to secure a good and cheering future for capital and labour, and the detailed statements from which this summary is gleaned affords still further evidence of the vitality of the Britisher, especially in matters of peace and prosperity. Whether battling with the forest, the jungle, or with England's enemies, her children exhibit an energy which only those who spring from Northern blood appear to possess.

The native flax (Phormium tenax) has not been grown to the extent that it is capable of, but may be cultivated to any amount. It is one of the finest textile fibres yet known, but the process of preparing it to suit the English market has only recently been arrived at and perfectly understood, so that we may hereafter find that useful product exported in very considerably larger quantities, by the importation of Chinese labour for its cultivation and preparation.

It may be well to remark that gold is not the only metal that this colony possesses in abundance, and as yet unwrought in its present infantine state—it has its productive silver deposits, probably to the extent of Nevada; its iron, of first-rate quality; and coal. These are known to abound, and it may not be too much to presume that copper and lead will be found before another two years have passed over this youngest child of the English family. J. BARWISE.

Aug. 10.

TIN IN QUARTZ, AND TIN IN ELVAN.

SIR,—One of the most interesting scientific and practical discoveries that have been made in recent years in Cornwall is that of the occurrence of tinstone in those extensive lodes of quartz and elvan which run through some of the best-known mining districts, more particularly in the neighbourhood of Bodmin, and near to Grampound Road, in the parish of St. Stephen's, by St. Austell.

In the former of these districts pure oxide of tin has been discovered in considerable quantities in a lode of white quartzite, and the Reperry Mine owes its existence to this remarkable circumstance. The lode was discovered and opened last November, and it is now found that certain smaller veins or feeders run into it, and are very rich in tin. Several specimens of the tin-bearing quartzite from the Reperry Mine have been examined during the last few months in my laboratory, and the results are not devoid of interest. The mine itself is situated at the top of a hill, about 200 ft. high. At 15 fms. the quartz lode is 2½ ft. wide, and, from the quantity of tin it contains, has been estimated by mining engineers to be worth about 50*l.* per fathom for the whole length explored.

Two analyses of this quartz lode have given me the following figures:—The specific gravity of the rock varies with the amount of tin it contains, and the greater the specific gravity the richer the ore, supposing wolfram (a very heavy mineral) to be entirely absent, which is the case here. I should state that I have requested and obtained from the Reperry Mining Company, for whom they were made, permission to publish the results of these analyses, without which they could not, of course, have been communicated to your readers:—

	I.	II.	III.	IV.
Specific gravity	3·19	3·23	5·60	6·30
Oxide of tin	15·90	28·80	65·44	85·00
Oxide of iron, &c.	12·04	11·20	4·56	4·29
Quartz rock	72·06	60·00	30·00	10·71
	100·00			

The first two samples were grey, and tolerably uniform in appearance, yielding respectively 12½ and 22·63 per cent. of metallic tin. The two following, from one of the feeders, were dark brown, with veins of white quartz running through them, and yielding respectively 51·47 and 68·86 per cent. of metallic tin. It will be observed how very rapidly the specific gravity increases as the stones become richer in tin. Only a trace of manganese was found in these analyses, and not a vestige of tungstic acid, so that this ore is perfectly free from wolfram; it contains, however, a minute quantity of the raw mineral columbite, which I formerly discovered in some samples of wolfram from Auvergne, but this is the first time I have met with it in tin ore. This indication of columbite in the quartz gangue of the Reperry tin ore will prove attractive to the mineralogists of the district, and it is to be hoped that cabinet specimens may some day be met with in this mine. It is a curious fact that in the columbite from Bavaria and other localities a small quantity of tin oxide (about 0·5 per cent.) is usually found.

As to the form in which the oxide of tin exists in the Reperry lode, it seems to be diffused entirely through the quartz; here and there it appears as very thin black strings (and probably these are the places where the columbite exists also), and sometimes in small spots. In some parts of the lode, or in the feeders, the tinstone is predominant, and the quartz exchanges its grey tint for the brown colour and resinous lustre which characterises the tin ore. Judging from the specimens forwarded here, I am inclined to believe that this recently-discovered lode of tin-bearing quartz will be worked with success, and that it will prove as profitable in a practical sense as it is interesting in a scientific point of view.

In the other district, near to Grampound-road railway station, a very large elvan lode, of a most interesting character, was discovered to contain oxide of tin, in the year 1864. The discovery was made accidentally by a tin miner, who found the lode cropping out in a narrow lane, not much frequented by the inhabitants of the locality, and he recognised spots of oxide of tin interspersed among the hornblende crystals of the elvan. By-and-bye attention was attracted to the subject, and this very lode is now about to be worked by the Terras Tin Mining Company.

The elvan consists of a felspathic and hornblende basis, interspersed with spots of quartz and larger spots of crystalline hornblende, of a dark-green colour. Here and there are distinctly seen among the latter spots of oxide of tin, of a brown colour, and bright resinous lustre—some circular, others oblong, and properly isolated from the other ingredients of the rock. I made an analysis of this ore a short time ago, and have obtained permission to publish it in your columns. The specific gravity was not taken, but the stone was very heavy. It yielded:—

Oxide of tin	10
Oxide of iron, &c.	4
Rock	86
	100

This is equivalent to 7·86 per cent. of metallic tin, or about 176 lbs. to the ton—a result by no means to be despised in a practical sense.

Here, again, the ore was found to be perfectly free from wolfram—in fact, no other metallic mineral was present except the tinstone, and this, as I have said, distributed over the rock in isolated spots. This lode at the Terras Tin Mine is no less than 30 to 50 ft. wide; it lies almost due north-south, being crossed east and west by numerous small tin lodes; it has been explored to the depth of 25 ft. only, and becomes richer in tin with the depth. I have found in the little cavities existing in the lode some very beautiful crystals of a me-

tallic aspect, which do not appear to be bronzite, and if not, we have, perhaps, here another new and interesting mineral species to add to the number already discovered in Cornwall. It forms needles, or pointed prisms, which seen in one direction are dark olive green, like some kinds of hornblende, or pyroxen, but when viewed at right angles to this direction they take a bright metallic lustre, like gold or bronze. I have not yet had opportunity of examining them thoroughly. They are not copper ores, or any other metallic mineral. The reason why I allude to these beautiful little golden crystals here is that they glisten alike in the small cavities of the Reperry ore, as well as in those of the Terras Tin Mine, and are, perhaps, characteristic of these interesting tin-bearing lodes.

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MINING IN THE ISLE OF MAN.

Sir,—Having recently visited the Isle of Man, and inspected its important mines, I read with much interest the letter by a "Miner," in the Supplement to last week's Journal, and now beg to add a few particulars gathered during my visit, which may not be altogether uninteresting to your readers.

The singular appellation of the island is probably derived from the Saxon word *Mang* (among), it being situate nearly midchannel in the Irish Sea. Nearly the whole of the surface of the island as shown at high water consists of grauwacke and clay-slate. The rocks all belong to the Palæozoic and Pleistocene formation. Old redstone and granite appear in one or two districts, and not far from the Foxdale Mines is a deposit of trappean limestone and shale beds, from which the black marble steps of St. Paul's Cathedral were supplied. The hills of the island are of a rounded form, no doubt due to their submersion under the sea. It is supposed by some that originally the island was much larger, and that there was a slow and quiet subsidence of the land for a lengthened period; then a re-elevation, to such an extent as to lay dry the whole area of the Irish Sea, and so united the Isle of Man with the surrounding countries. There was, however, a subsequent period of subsidence to a partial extent, and then arrived the stationary period, as at present.

It is difficult to ascertain the exact period when the mines in the island were first worked, but from the fact of "feather wedges," a contrivance for breaking rock asunder, having been found in the Brada Mines, it is inferred that they were wrought previous to the discovery of gunpowder, in the year 1250. The earliest authenticated record of mines in the island is in the time of Sir John Stanley the First, who was created King of Man by Henry the Fourth, in the year 1405. On reference to some old books of the revenue it appears that in the year 1709 the Earl of Derby paid the miners for about 70 tons of lead, and from 1709 to 1713 for about 30 tons yearly. The annual produce is now about 4000 tons of lead, double that amount of blende, and about 500 tons of copper. It is only during the present century that the great mineral wealth of the island has thus far been developed.

The Foxdale Mining Company, some fifty years ago, obtained a mineral grant of the whole of the island, except the Laxey Glen, and made explorations in various parts, among others upon a lode near Ramsey, on the sea shore (now being worked by the Northern Silver-Lead and Blende Mining Company, Limited, of which property more anon). Afterwards this grant was rescinded, and confined to a limit immediately contiguous to their mines at Foxdale. The day I visited that part of the island Capt. Kitto was, to my great disappointment, absent: but his son politely explained the surface workings, and showed me a specimen of the silver ore (polytelite), which sells at the high rate of 800*l.* a ton. The present workings have reached a depth of 115 fathoms. There are about 400 hands employed, and the return of ore is over 100 tons per month, realising from 23*l.* to 24*l.* per ton, from its richness in silver.

On the other side of the island to Foxdale, and about a mile up the picturesque and romantic glen of Laxey, or Salmon river (Laxey being the Manx for salmon), on either side of which are comfortable whitewashed cottages dotted here and there, is seen a gigantic water-wheel, at once indicating the position of the Great Laxey Mine.

The mine being situated at the foot of Snei-feldt (snow field), the highest mountain in the island, some 2000 feet above the sea, and also being contiguous to the high road between Ramsey and Douglas, it at once becomes an object of attraction to the tourist passing from one town to the other. It has, therefore, been found necessary to issue tickets to those wishing to inspect the surface operations of the mine. These are always courteously given on application at the residence of Capt. Rowe, who has charge of the mine. I, however, wished to inspect the mine itself, and upon making known my request to Capt. Rowe he at once politely acquiesced, and placed one of the foremen at my service.

The engine-shaft is now sinking below the 220 fm. level, or over a quarter of a mile in depth, the ascent from which by ladders is no joke to the uninitiated. The lode in the bottom is estimated at 50*l.* per fathom, in the 210 at 150*l.*, in the 200 at 80*l.*, in the 190 at about 40*l.*, and in the 180 at about 100*l.* These figures will at once enable the miner and shareholder to see how the present annual profit of 30,000*l.* is acquired. These results, however, have only been obtained after many years, and after three different companies had expended labour and capital upon its working. The history of its prosperity is this:—Some 25 years ago Capt. Rowe was invited to take the management,—the adventurers, few in number, had become disheartened, having spent the whole of their capital, with very inadequate returns. After a careful inspection and study of the mine, Captain Rowe felt satisfied that it only wanted additional capital to put the mine in depth, as operations had been starved for a long time from want of means. Mr. Dumbell, the banker of the island, feeling confidence in what Capt. Rowe said, placed a credit of 5000*l.* at his disposal to carry out his plans.

Nor was such confidence misplaced. In the course of two and a half years the whole of the bank debt was repaid, and in the third year the first dividend was declared. This increased, until the annual profits amounted to 30,000*l.* Then came a period of driving through comparatively poor ground, and the necessity for putting up expensive machinery, so that during a period of six years 40,000*l.* was spent out of profits on this work, and the shareholders had to forego their dividends. At this time the original shareholders were nearly all old people, and the shares being held in few hands, it was thought advisable to form a limited liability company to carry on the works. This was scarcely done when the mine again "cut rich," and the 4*l.* shares immediately rose to 22*l.* Since then 30,000*l.* have been annually divided among the fortunate shareholders—a realisation of 50 per cent. per annum, with every prospect of long continuance.

At this mine may be seen, close together and using the same water power, the oldest and the latest inventions in hydraulics. The largest and the smallest water-wheels. The latter, a turbine of 21 in., doing the same amount of work as its gigantic neighbour of 72 ft., and 6 ft. 6 in. waterway. The latter pumps the water out of the mine, while the former draws the ore to surface.

In company with Capt. Rowe and the Chairman of the Northern Silver-Lead and Blende Mining Company, I visited a most promising looking property on the sea shore near Ramsey, lately acquired by this company. I here found all the characteristics of the Laxey Mine, but with the advantage that it is at least 150 feet nearer the level of the sea than the Laxey, which is on the side of a hill. As all the mines in the island make rich in depth, this is a point gained, the depth to be driven through being that amount diminished. Capt. Rowe also pointed out an elvan course 300 ft. wide, which would intersect the lode about 100 fms. seaward, and called my attention to the fact that at low-water mark the lode was 3 ft. wide, full of lead and blende, similar in quality to the Laxey. Upon examination the elvan was found to contain sulphur mundic in large quantities, and as Cornishmen say "Mundic never rides a bad horse," the prospects of this lode proving rich at the junction of the elvan is an absolute certainty. In addition to these advantages comprised in the grant to the company is a large tract of ground inland, which from its surface configuration could not present more desirable features to a miner, more especially as an oblique lode to the west will here form a junction with the others, and no doubt give important results when opened out, as in similar intersections in the Foxdale and other mines. This mine, like its insular neighbours, is situate in the clay-slate, or Cornish killas, so productive of argentiferous galena, and I venture to predict that, with due economy, and continuing the present shaft to a depth of 40 fms. before following the lode under the sea, or driving to the point of intersection of the lodes inland, that certain and profitable returns will be the result at both points.

Near this mine, marking the boundary of a field, in a hedge may be seen a large slab of stone, which will gladden the heart of an antiquary, as it is evidently an ancient monument. It has a rude cross carved upon its flat surface, probably a Runic or Danish tombstone, and deserves a more fitting resting place.

I had not time to visit the North Laxey Mine, but from what I heard I should think it would not be long before it is in a dividend-paying state. I am glad to find from the report in last week's Journal of the shareholders' meeting that they have determined to subscribe further capital and put the mine deeper, as it is in depth that the riches of this island are to be found.

From the cursory inspection I made, and the facts brought to my knowledge, it would appear there are many promising lodes, especially beds of iron, that well deserve a trial; but, like the cobbler's children, who go the worse shod, the Isle of Man people, for want of enterprise, allow strangers slowly to develope the mineral wealth lying at their own doors.

In conclusion, I will only further mention an historical event of a very early period. It is stated that the first king of the Isle of Man, who reigned some 300 years B.C., one Mannan-mac-chier (Son of the Sea), was a great magician, who could with a word envelope the land in a dense mist, and when need arose make one man appear as a hundred. This mighty potentate still reigns in the island, but as there is no necessity of figuratively increasing the population, he has exercised his power in another way,—by making one pound return a hundred, when spent in rightly developing the mineral riches of his domain. Long may he reign!—*The Temple, Aug. 5.* T. A. Masey.

ASSHETON AND TAN-YR-ALLT MINES.

Sir,—It is a great pity that parties connected with mines cannot extol one mine except at the expense of another. In last week's Journal I read with interest a letter by "A Miner," defending the above mines, against some unfavourable imputations cast upon them by Mr. Cooke: that letter, although brief, is full of logic, and needs no comment from my pen; but a few words on the nature of the district, and the progress that is being made towards developing the mines, may be interesting to some of your readers. I may here state that I have not been favoured with seeing those mines underground, but have several times gone over the surface, and obtained a great deal of information from reliable authority respecting the general appearance of the mines underground; and my impression is that the Assheton district will eventually become one of great importance. To expect large returns of lead at the present time would be most unreasonable, seeing the short time that has expired since operations were commenced; but any person who will pay a visit to that part can but be struck with the rapid progress that is being made for opening up and developing the mines. The number of lodes that traverse the district in every direction is truly surprising—in fact, the whole promontory is a net-work of lodes forming *junctions* and *intersections* almost without number. The nature of the lodes seem to bear a closer analogy to the Cornish lodes than anything I have yet seen in Wales, having a matrix of quartz and other silicates. For this reason I think the ore is not so likely to be cut off at a shallow depth as if they were purely clay-slate lodes.

The remark which "A Miner" made when comparing those mines with the Tankerville is very strong, but it is almost precisely the same as that which a respectable mining engineer made to me some time ago, when conversing about the Assheton Mine, only he referred to another mine equal to, if not held in higher repute than, the Tankerville Mine. Although those mines have not the advantage of streams of water for motive power, like many of the Welsh mines, yet, taking into consideration that materials and ores can be shipped directly to and from the mines by vessels, the facilities for working the mines are not inferior to few mines in the Principality.

Besides the above-named mines, there are others which have been started under very favourable auspices, and are likely to take a place among the leading mines in Wales. The whole neighbourhood, which for a long time had been shrouded in midnight gloom, is now rejoicing at the approach of day—in hope that it will be long-lived and unclouded.—*Pen-y-Groes, Aug. 9.* J. Roberts.

[For remainder of Original Correspondence see to-day's Journal.]

FOREIGN MINING AND METALLURGY.

The proceedings at the last meeting of the Champagne Committee of Forgemasters were comparatively unimportant. Orders have been far from abundant of late in the Champagne district. Rough pig remains neglected, but merchants' iron is in tolerably good demand. There has not been much doing in casting pig. Rolled iron from coke-made pig is dealt in at 9*l.* 8s. to 9*l.* 12s. per ton, first quality; 8*l.* 16s. to 9*l.* 4s. per ton, second quality; and mixed iron, 8*l.* 12s. to 9*l.* per ton, according to quality. Coke-made iron is at somewhat irregular prices; some forges quote it at 8*l.* per ton, others will not take engagements below 8*l.* 12s. per ton. Sheets maintain themselves firmly at 9*l.* 6s. to 9*l.* 12s. per ton, first category. Machine iron maintains a good tone, and the works are pretty well employed in fulfilling old contracts. Many forgemasters have to suffer from the irregularity which the war has occasioned in the ordinary train service of the Eastern of France Railway, and their works are encumbered with goods in consequence. The ironmasters of the Luxembourg are making great efforts to keep their furnaces going. As regards the trade of the Moselle group, it is difficult at present to make any report. With an immense conflict pending like the present continental war, what may be true to-day may be falsified to-morrow. The foundries of the Ardennes are well employed at present. The council of administration of the Aveyron New Collieries and Foundries Company has decided on carrying out immediate works for bringing the waters of the Lot to Decazeville. It is hoped that the drought which frequently threatens the works and the important working population whom they employ will thus be avoided. A good supply of drinkable water will also be assured to the town,—a matter of considerable importance to the inhabitants. The laying of the necessary pipes has been entrusted to MM. Fortin and Hermann, who have had considerable experience in the execution of similar works at Paris. The same firm was charged last year with similar works at Aurillac, and it has also undertaken canalisation operations which are about to be carried out at Mur-de-Barres. The foundries of the Meuse are still active, but stocks of goods begin to accumulate. Nothing can be forwarded to Paris, the ordinary means of railway transit being monopolised by the army, while the navigations are almost dry, and rates of freight doubled. The proprietors of the Bar-le-Duc Works have completed a second blast-furnace, but the lighting it has been delayed by the difficulties experienced in procuring the necessary combustibles. In the Ardennes and the Moselle many establishments are idle for the same reason.

The condition of the Belgian coal trade continues satisfactory; orders flow in in such quantities for all qualities of coal that it is very difficult, not to say impossible, to keep pace with them. Railway rolling stock begins to make default in some cases. The extraction being necessarily reduced, and stocks nearly *nil*, prices are sustained with extraordinary firmness. Belgian coal-consuming industries not being affected at present by the calamity of war, and the sugar-producing season being close at hand, it is probable that the good tone which is at present noticed in the Belgian coal trade will continue. The various branches of Belgian metallurgical industry appear to be suffering less than might be expected from the war which has broken out upon the Continent. Rails, however, must be excepted from this remark, and rails, it must be remembered, have for a long time past supplied a large contingent of employment to the Belgian works. Efforts have been made to induce the Minister of Public Works to give out at once a large order for rails for the Belgian State Railways. It was suggested that 50,000 tons of rails should be ordered in this manner, the orders to be divided among the various works of the Charleroi and Liége groups. The Minister of Public Works expressed his readiness to order 15,000 tons, but before positively giving out an order for that quantity he asked upon what conditions producers were prepared to treat. In the present temper of Belgian industrials they are likely to do all in their power to fall in with the views and wishes of the Minister. Since the outbreak of the Franco-Prussian war a considerable stock of manufactured products has accumulated at many works, it being impossible to deliver them with security. In order to improve the means of communication between the east and west of Europe, the Austrian Government has made arrangements for the establishment of a regular and direct line of steamers between Trieste, London, Liverpool, and Southampton.

The Cologne Company for the Construction of Engines and Machinery effected a production last year, which was valued at 1,368,760 thalers, the corresponding value for 1868 having been 1,212,479 thalers. During the whole of last year all the workshops were actively employed, and at the close of 1869 the company had still orders unexecuted to the estimated amount of 580,000 thalers. The operations of last year were less profitable than hitherto as regards bridges, railway material, and heavy castings; this was due to the greater competition which the company had to sustain, and it was also owing to the advance which took place last year in the prices of many descriptions of materials. The construction of machinery, properly so called, produced better results, the company having had considerable orders to execute on foreign account. A further extension was given to the company's enterprise during 1869, as well by the purchase of new lands, as by an extension of certain workshops, and an increase of plant. The dividend distributed for 1869 upon the share capital of the company was 10 per cent.

The French copper markets do not present any material improvement. Chilian in bars delivered at Havre has made 66*l.* per ton; ditto in ingots, 70*l.*; Corocoro minerals (pure copper), 73*l.* per ton. The French, Dutch, and German tin markets show little variation. The stock of Banca was last returned at 193,870 ingots, as compared with 157,049 ingots at the corresponding date of 1869. Some transactions have taken place in Banca at Rotterdam at 69 fls. At Rotterdam, Stolberg lead has been held at 11 fls.; the stock is almost exhausted at Rotterdam, and orders of any importance would be declined. At Paris, Silesian zinc and other good marks have made 20*l.* 8s. per ton. At Breslau and in Germany there has not been much doing in zinc of late.

FOREIGN MINES.

Battle Mountain.—Wm. Nancarrow, July 19: Virgin Lode: In the level driving north of winze the lode is 3 ft. wide—a good lode, but not quite so rich as last week, but it is very changeable, and likely by to-morrow to be as rich as ever. The stope in the back, the nearer we get towards the shaft does not look quite so well, but in a day or two we shall get in our timber or stull; then we shall be able to leave all our waste dirt, which at the present time we have to draw to surface, on the stull to fill up, instead of putting in more timber; this piece of ground will yield a good lot of first class ore between the two levels; there can be no doubt whatever of this, as the ground is all cut out. In the south end at this, the 73 ft. level, the lode is still large, 4 ft. wide, producing good stones of ore, and all the lode is stained with copper, but not rich enough to put into the ore-house, but the indications are good enough to expect an improvement here in a very short time.—Lake Superior: In the north level the lode, which is still from 4 to 5 feet wide, is looking more promising than I have yet seen it since we began to drive from the shaft, producing some splendid stones of rich copper ore, and I look forward in a short time to be able to report to you a great and good change in this level. In the south end the lode is still in a very disordered state by the second slide, I told you about in my last, the ground being a soapy clay-slate. We are still sinking the shaft on the Hallow's ledge, but so far it is of no value whatever since the first few feet on the top; but I intend to run this shaft down some 40 ft. or more to prove the lode. I think this lode is a continuation north of the Lake Superior. We are still sinking the Troy shaft, but the lode does not improve at all; the ground is very similar to what we drove through in the tunnel below. I intend to take those men to-morrow and put them down in what we call Pickett's shaft, on our North Virgin, to make a communication with our 36 ft. level. This we do for ventilation, to carry our works on the Virgin lode to the best advantage, as the weather is extremely hot, and the air very light. I shipped at the railway station last Thursday 910 sacks of ore, and left 49 behind, as I could not get any more cars; since then we have sent down from the Virgin Mine 300 sacks to Lake Superior, 120: together, 420 sacks, and have about 100 here filled now on the mine.

Cape (Copper).—The directors have received despatches. The Spectakel, Springbok, and Koperberg reports are received, and are favourable. Koperberg has very much improved, the adit level now yielding from 3 to 4 tons of rich ore per fathom. Traffic on completed portion of tramway, as well as extension of the works, proceeding satisfactorily; 38 tons of copper ore were sold on the 2nd inst. by public ticket, at 13s. 1d. per unit.

Spectakel, F. Kent, June 15: Since my report of May 15, the 36 fm. level south of Arend's pitch, has been driven 6 ft. 2 in.; the total length of level being 16 ft. 1 in.; this driving is now suspended, and we are stoping away the ore ground driven through, which produces 2 tons of ore per fathom; it is worked by two men and and two labourers, for 6 fms., at 7*l.* per fathom. The 36 fm. level, east of Arend's pitch, has been driven 15 ft. 2 in. through ground producing but little ore, but I am glad to say within the last day or so the end has improved, and will now yield 1 ton of ore per fathom; the total length of the level is 5 fms. 5 ft., and is now worked by two men and two labourers, for 2 fms., at 16*l.* per fathom. The 36 fm. level, west of Arend's pitch, has been driven 6 ft.; the total length of level being 19 ft. 4 in.; the end is in good ore ground, producing 2½ tons of ore per fathom, but in consequence of having holed to a piece of ground formerly worked by tributers, which is filled with attle, and which must be cleared before the driving could be carried on, and as it would have to be all drawn out by hand, thereby incurring several pounds expenses, we have deemed it best to commence the 36 fm. level, east from the incline, towards this point, where I am glad to say it looks well, and will yield 3 tons of ore per fathom; the ground driven is 9 ft. 4 in., and is worked by one man and four labourers, at 14*l.* per fathom, for 2 fms. The 27 fathom level has been driven south on the flookan course 3 fms. 1 ft. 7 in.; we are getting some very rich grey ore from this place, and I consider the end at present worth 18*l.* per fathom; it is now worked by one man and one labourer, for the month, at 5*l.* per fathom. The incline has been sunk 11 ft. 7 in., producing 3 tons of ore per fathom; the ore in this place is getting more solid, and the indications, I think, are such as will warrant expectation for further improvement; the total depth is 39 fms. 1 ft. 7 in., and is now worked by one man and eight labourers, for 1 fm., at 40*l.* per fathom. We have driven a level 11 ft. 3 in. west of Thomas's pitch; this is between the 15 and 27 fm. levels, but as the end is poor we have commenced stoping away the ore ground, which is yielding about 2 tons per fathom, and is worked by one man and four labourers, for 5 fms., at 4*l.* per fathom. There are two stopes at work in the back of the 27 fm. level, east of Thomas's pitch, which will at present average 4 tons of ore per fathom: they are worked by one man and seven labourers, the price on one is 7*l.* per fathom, for 6 fms., and the other 9*l.* per fathom, for 2 fms. The stope under the 27 fm. level cast will yield 6 tons of ore per fathom, and is worked by one man and eight labourers, for 4 fms., at 14*l.* per fathom. The stope in the bottom of Arend's pitch will yield 4 tons of ore per fathom, and is worked by one man and eight labourers, for 12 fms., at 4*l.* 10s. per fathom; and the stope in the back will also yield 4 tons of ore per fathom, and is worked by one man and five labourers, for 10 fms., at 4*l.* per fathom. We raised last month 115 tons of ore, averaging 33 per cent., and I am glad to say that we are getting supplied with timber, which will enable us to get on with the dressing-floors, to which every attention shall be paid, so as to get it into working order as soon as possible. I beg to state that I consider the mine to be looking very healthy, and holding out good indications for further improvements, and I believe that as soon as more ground is opened up, particularly in depth, it will be followed with good results.—P.S. Since writing the above the 36 fm. level, driving east of Arend's pitch, has improved; it will yield 2 tons of ore per fathom.

Koperberg, Capt. Williams, June 25: This mine during the past month has very much improved. The adit level, east of Jones's shaft, has been extended about 17 fms. In good copper ore ground, that will yield about 2 tons per fathom; at present it will yield from 3 to 4 tons of rich ore per fathom, and is looking very promising to improve. We propose sinking a new shaft on the course of the lode about 14 fms. in advance of the present end for ventilation, and opening the mine as expeditiously as possible.—Springbok Fontein: In the shaft sinking below the adit level we have met with a rich branch of copper ore, that will yield from ½ to 1 ton per fathom, and, judging from its present appearance, I think it will to lead to good results. We have suspended the cross-cut, driving north for the present, and put the men in the shaft to facilitate the opening up of this part of the mine. I am sorry there is nothing new to report at Nababeep.

Val Antigoria.—Thomas Roberts, Aug. 2: On the 1st instant we consigned to Carlo Menozzi one ingot of gold, weighing 9 ozs. 5 dwts. 3 grs., obtained from 13⅛ tons of ore. The whole of which came from the stopes in the back of the 20, on No. 1 lode, shows a lower produce than the average of ore from the stopes in the back of the 30, on this lode. The ore that we intend to amalgamate in the present month will be a mixture of ore from the 20 and 30. The stopes in the back of the 30 yield 15 dwts. ore per fathom; and the stopes in the back of the 20 yield 3 tons per fathom. The incline shaft, on No. 2 lode, is down under the 20 fm. level 23 metres on the incline, and a small rise has been put up from the back of the 30 fm. level 9 metres. We hope to communicate the sinking to the rise this month, after which we shall commence to cut down the rise for the width of the shaft, and lay down the tramroad in it. The cross-cut driving east from the 20, to meet the intersection of No. 1 to No. 3 lode, has been driven 14½ metres of the estimated distance of 22 metres. On surface our forces are employed preparing to put in operation the new stone-breaker, crusher, and jigging-machine. A new water-wheel, to drive the stone-breaker and crusher, has been built, and put in the wheel-pit. The carpenters are now making and putting launders to carry water to the wheel, and the masons are building walls to carry the jigging water-wheel. The jigging-wheel will be commenced at once.

[For remainder of Foreign Mines see to-day's Journal.]

Treating Gases.—The invention of Mr. W. Gossage, Widnes, consists in causing the gases proceeding from the calcination of copper ore or of regulus, or from the melting of calcined copper ore or of regulus, to be passed through a condensing apparatus, similar to that which is so commonly employed for the condensation of hydrochloric acid in the manufacture of sulphate of soda for the production of alkali, for which apparatus the inventor obtained letters patent, dated Dec. 24, 1836.

Manufacture of Gas.—Messrs. A. Upward, J. Bannehr, and T. P. Dale, Goswell-road, use coal (or other solid gas-making material) in a finely powdered state, and cause it to be carried by a current of gas into a highly heated pipe or retort, where the coal or other material yields up the gas, and the coke which remains is collected in a suitable chamber. A portion of the gas is drawn off to be purified for use, whilst a further portion is taken to form the current requisite to carry the powdered coal or material through the heated pipe or retort; liquid gas-making materials may be similarly employed.

London: Printed by Richard Middleton, and published by Henry English (the proprietors), at their offices, 26, Fleet Street, E.C., where all communications are requested to be addressed.—*August 13, 1870.*